REMARKS

I.   Status of the Claims

Claims 1-25 are pending in this application.

Claims 1-6 and 9-25 remain rejected under 35 U.S.C. § 102(b) and/or 35 U.S.C. § 103(a) as anticipated by or as obvious over U.S. Patent No. 5,227,419 ("Moczygemba"), and under 35 U.S.C. § 102(b) and/or 35 U.S.C. § 103(a) as anticipated by or as obvious over U.S. Patent No. 6,162,867 ("Gunterberg").

"Claims 7 and 8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form . . . ." *Final Office Action* at 4.

Claim 1 has been amended to recite "45 to 80% by weight of the styrenes . . . " instead of "40 to 80% . . . ." Support for this amendment can be found, for example, at pages 11 and 21 of the specification. No new matter has been introduced.

II.   Rejection over *Moczygemba*

In the *Final Office Action*, the Examiner has maintained the rejection of claims 1-6 and 9-25 over *Moczygemba*. The Examiner reasoned that the block copolymer of *Moczygemba*'s run 2 meets all of this application's claim limitations because *Moczygemba* discloses producing block copolymers by methods comprising some reactants similar to those used to produce certain block copolymers claimed by Applicants. *Final Office Action* at 2-3. The Examiner previously found it "unreasonable to assume that none of the styrene in the step 4 monomer charge will be incorporated into the terminal polystyrene block arising from the final step 5 charge of styrene." *Office Action of August 28, 2009* at 5. Now the Examiner further contends that "even a

completely random block would contain at least one styrene terminal unit half of the time . . ." *Final Office Action* at 4. Based on this understanding of *Moczygemba*, the Examiner contends that *Moczygemba's* terminal units should be considered "styrenes having an average polymerization degree of 30 or more." *Id.*

Applicants submit that this position is refuted by the disclosure of *Moczygemba* itself, and respectfully request that this rejection be withdrawn. In the alternative, Applicants submit that even under the Examiner's interpretation of *Moczygemba*, that reference would not disclose each and every limitation of Applicants' claims.

To review, Applicants previously argued, in a response dated June 23, 2009, that *Moczygemba* teaches a method of generating block copolymers in example 2 which does not anticipate or render obvious the claimed block copolymer. Example 2 teaches a polymer synthesis comprising 5 steps: (i) mixing 0.016 phm n-butyllithium (NBL) as an initiator to 30 phm styrene; (ii) adding a second charge of 0.058 phm NBL and 12 phm styrene; (iii) adding 12.5 phm butadiene; (iv) adding 17.5 phm styrene and 17.5 phm butadiene; and finally (v) adding 10.5 phm styrene. *Col. 9, lines 30-61*. It is not disputed that steps 1, 2, and 5 add homopolystyrene to the block copolymer that is formed, since only styrene is added during those steps. It is also not disputed that step 3 does not add any appreciable amount of homopolystyrene since no styrene is added during that step. In addition, applicants', show that steps 1, 2, 4 and 5 combine to form at most, **38% by weight** of a block having a molecular weight of 35,000 or less among the styrene blocks. Applicants provided detailed calculations concerning steps 1, 2, and 5 in their Response of October 28, 2008 at pages 6-11. Below, Applicants provide calculations pertaining to the amount of styrene resulting from step 4.

Step 4 is a polymerization generating a random structure and tapering (by gradient) the styrene/butadiene ratio. Applicants submit that the nature of the styrene generated in step 4 (and later bonded during step 5) may be determined by styrene/butadiene ratio (ratio by weight) upon termination of polymerization of step 4.

In step 4, when styrene and butadiene are added, the styrene/butadiene ratio is 50/50; then, when the polymerization is started, the styrene/butadiene ratio is 10/90; and after termination of the polymerization, the styrene/butadiene ratio becomes 90/10. In the above described case, after termination of the polymerization of step 4 (styrene/butadiene ratio = 90/10), the amount of the terminal styrene chain is calculated as follows:

Moles of styrene = 90/104 (molecular weight of styrene) = 0.865;

Moles of butadiene = 10/54 (molecular weight of butadiene) = 0.185;

Styrene (molar ratio) = 0.865/(0.865+0.185)X100 = 82;

Butadiene (molar ratio) = 0.185/(0.865+0.185)X100 = 18.

Based on the above calculations, the molar ratio of styrene/butadiene is "82/18".

The terminal styrene chain arising from step 4 is about 4 moles (82/18 = about 4), and the mass of the terminal styrene is about **400 g**.[1]

When all of styrene in step 4 is converted into polystyrene, the molecular weight thereof is **15,100**. This value may be calculated as follows:

The amount of styrene from step 4 (see col. 9, lines 50) is **17.5**;

The amount of NBL in Run 2 (0.016(step 1) + 0.058 (step 2)) is **0.074**;

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[1] 4 moles x 104 grams per mole (i.e., the molecular weight of styrene)

The molecular weight of NBL is **64** grams per mole.

Using the above calculated numbers, 17.5 / (0.074/64) is about **15,100**.

The amount of styrene having a molecular weight of 35,000 or less is **0.46**. This value may be calculated as follows:

17.5 (the amount of styrene in step 4) X 400 / 15,100 = 0.46

Therefore, the amount of the terminal styrene (i.e., 400) corresponds to the styrene amount in step 4 (i.e., 0.46). Using the above described values, the amount of styrene *block* having a molecular weight of 35,000 or less may be calculated as follows:

(9.4+0.46+10.5) / (30+12+0.46+10.5) X 100 **= 38.4%**

Amended claim 1 requires **45 to 80%** by weight of the styrenes having a molecular weight of 35,000 or less. Accordingly, even under the Examiner's interpretation concerning the amount of styrene in the terminal units, *Moczygemba* fails to disclose or suggest the weight range required by the claims in this application because **38% does not fall within the range of 45 to 80%**. This *difference* prevents *Moczygemba* from anticipating the claims in this application because anticipation under 35 U.S.C. 102 requires a disclosure of each and every element exactly as found in the claim at issue. *MPEP 2131.01*. Additionally, the Examiner has not provided any reasons for why this difference should be considered obvious. *In re Kahn,* 441 F.3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness"). Rejecting a claim requires articulating a reason for why the claim as a whole would have been obvious in view of all of the differences. *Id.* Here, the Examiner has not addressed at

least the difference in percent weight of styrene. Accordingly, the rejection of claims 1-6 and 9-25 over *Moczygemba* under 35 U.S.C. 103 should be withdrawn.

III.   Rejection over *Guntherberg*

In the *Final Office Action*, the Examiner has also maintained the rejection of claims 1-6 and 9-25 over *Guntherberg* on the grounds that it produces materials in a similar manner in its specification as compared to the present application's examples. *Final Office Action* at 3-4 and 5. As pointed out in the Response of December 23, 2009, Applicants respectfully disagree, and submit that the Examiner's argument regarding mixed charges of styrene/butadiene do not apply to *Guntherberg*. In particular, *Guntherberg* explicitly teaches that its mixed butadiene/styrene block comprises **random** units, and therefore cannot produce homopolystyrene blocks. In particular, steps 2 to 4 of *Guntherberg* illustrate the styrene/butadiene ratio is smaller than that exemplified in this application.[2] Additionally, *Guntherberg* uses more randomizer and longer polymerization times. Applicants submit that these differences in reaction components and conditions would produce polymers having a higher degree of randomness.

Since the present claims require **45% to 80%** by weight of styrenes having an average polymerization degree of 30 or more and having a molecular weight of 35,000 or less, *Guntherberg* fails to anticipate or render obvious any of the pending claims. All of claims 1-25 are allowable over *Guntherberg* for at least this reason. Notably, even if the styrene block rate in *Guntherberg's* steps 2 to 4 were considered equivalent to steps

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[2] *Guntherberg* exemplifies a 60/40 ratio of styrene to butadiene in contrast to the 82/18 ratio indicated for steps 2 to 6 of the A-1 embodiment in this application.

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2 to 6 in this application, the resulting polymer still would not meet the molecular weight limitation recited in claim 1. *See Amendments to the Claims* at Claim 1.

Even equating *Guntherberg's* block rate[3] with that exemplified in this application (41.9% by weight) would not lead to a polymer meeting the percent by weight limitation of 45 to 80%. *Guntherberg* discloses a polymer, C, which has a number average molecular weight of 131,000. Col. 14, lines 41-43. That polymer is synthesized in five steps (1-5). *See Col. 13* at lines 45-54 (tabularizing reactants used in each of steps 1-5). Each of steps 1 and 5 involves feeding only styrene, thereby generating homopolystyrene. Steps 2-4 involve feeding mixtures of styrene and butadiene together. The number average molecular weight of the styrene produced in each of steps 1 and 5 is about 14,000.[4] Steps 1 and 5 are the only steps that would produce homopolystyrene blocks because these are the only steps involving feeding styrene alone. Thus, *all* of the styrene polymer blocks in *Guntherberg's* component C would have a molecular weight of 35,000 or less. This value of 100% is outside of the range in claim 1 of this application, which recites "45 to 80% by weight . . . ."

Accordingly, even assuming that *Guntherberg's* block rate would be the same[5] as that disclosed in this application (41.9% by weight), *Guntherberg's* block copolymer would still not meet (or render obvious) all of the elements of claim 1 in this application.

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[3] As discussed above, Applicants submit that *Guntherberg's* conditions would lead to greater randomness than the conditions disclosed for making the block copolymers claimed in this application.

[4] 131,000 x (1048g/10043g)

[5] As discussed above, Applicants submit that *Guntherberg's* block rate would be lower because of increased randomness.

The Examiner also suggests that some styrene in step 4 could contribute to the terminal homopolystyene made in step 5. Even if the block of styrene produced in Guntherberg's step 4 were directly bonded to that produced in step 5, the molecular weight of the resulting block styrene would be 22,100.[6] Again, all (i.e., 100%) of the block styrene present in the polymer would "have a molecular weight of 35,000 or less . . . ." And again, 100% falls outside of the "45 to 80%" range that is recited claim 1 of this application.

IV. Conclusions

In view of the above remarks, Applicants respectfully request that the Examiner withdraw the rejections of claims 1-6 and 9-25 under 35 U.S.C. 102(b), or in the alternative 103(a). For each of the disclosures cited by the Examiner to support these rejections, the synthetic procedure disclosed would not produce a block copolymer within the limits recited in Applicants' claims. Notably, even accepting the hypothesis that *Guntherberg's* block rate would be equivalent to Applicants', *Guntherberg's* polymer still fails to disclose a polymer having 45-80% styrene blocks within the molecular weight range of 5,000 to 30,000. Additionally, the Examiner has not provided any objective evidence that shows reasons for why one would modify any of the cited references to arrive at Applicants' claims. Accordingly, Applicants respectfully request that the Examiner withdraw the rejections of claims 1-6 and 9-25 under 35 U.S.C. 102(b), or in the alternative 103(a).

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[6] 8,100 + 14,000; where the value of 8,100 was calculated as follows: 1477g x 0.419/10,043g. The value of 14,000 is discussed above.

Since the objections to claims 7 and 8 arose from their depending on rejected claims, these claims should be allowed upon withdrawing the rejections of the claims from which they depend.

If there are any fees due in connection with the filing of this response, please charge the fees to Deposit Account No. 06-0916. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our deposit account.

Respectfully submitted,

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Dated: July 16, 2010   By: *Charles E. Van Horn*

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